CALIFORNIA
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Forest Health *2008 highlights*

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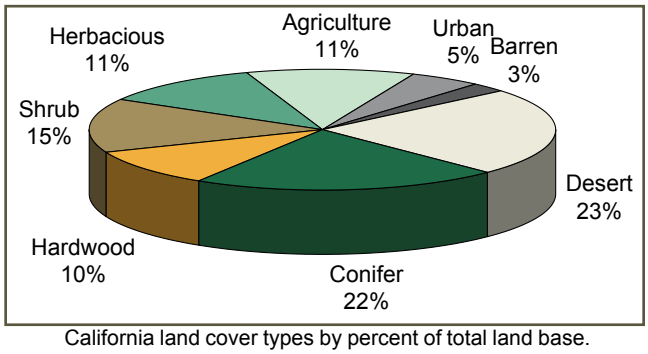
Forest Resource Summary

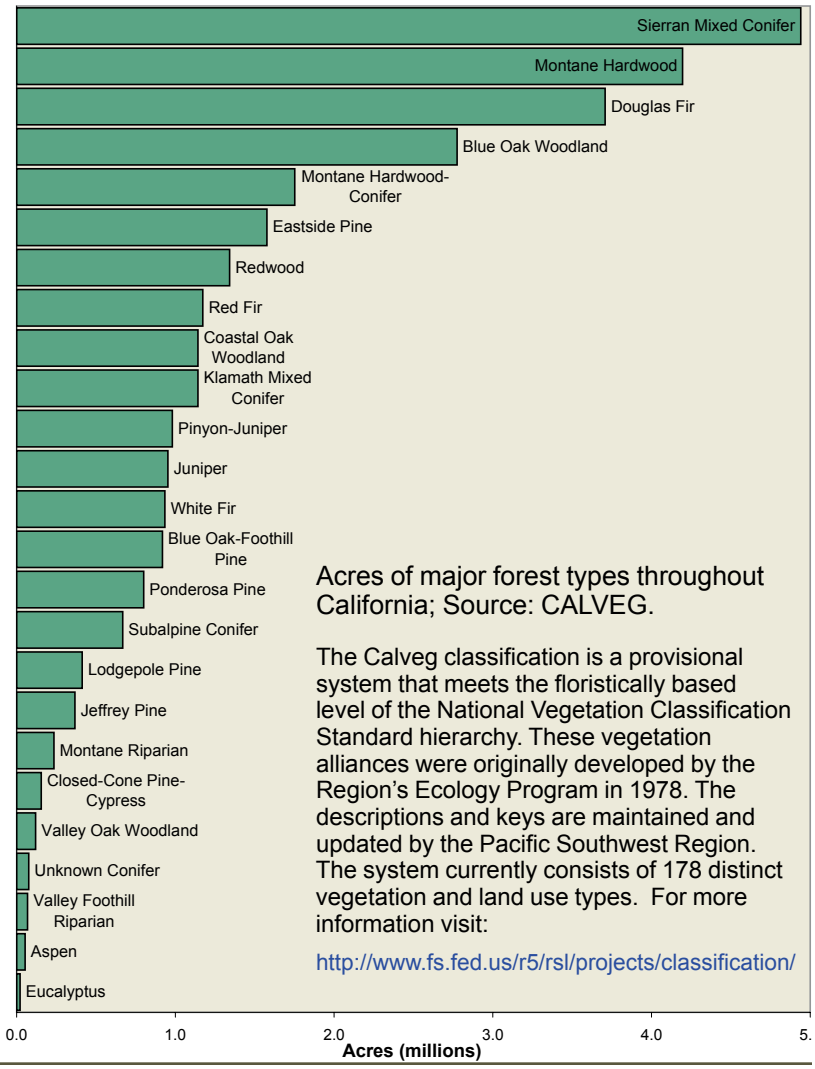
The USDA Forest Service and the California Department of Forestry and Fire Protection map, measure, monitor and assess the effects of biotic and abiotic agents in California's forests. California's forests are among the most complex and diverse in the nation, with 25 major forest types occurring across 32 million acres of the state.

Approximately 33% of California is forested and is susceptible to a variety of forest pests depending largely on geographic location, tree species composition, tree stocking, drought, air pollution and other environmental factors.



California land cover types by percent of total land base.

This report highlights forest health conditions in California in 2008. Some of this information has been taken from the annual report of the California Forest Pest Council, *Forest Pest Conditions in California - 2008.* It does not purport to be a historic review or an in-depth consideration of any particular forest insect, disease, or abiotic agent.



Acres of major forest types throughout California; Source: CALVEG.

The Calveg classification is a provisional system that meets the floristically based level of the National Vegetation Classification Standard hierarchy. These vegetation alliances were originally developed by the Region's Ecology Program in 1978. The descriptions and keys are maintained and updated by the Pacific Southwest Region. The system currently consists of 178 distinct vegetation and land use types. For more information visit:

http://www.fs.fed.us/r5/rsl/projects/classification/

National Forests of California

There are 18 National Forests in California, encompassing over 20 million acres. Our National Forests account for 25 percent of National Forest recreation nationwide and about half of the public wildland recreation in California. National Parks and other federal, state, county and private lands comprise the remainder. http://www.fs.fed.us/r5/

Bark and Engraver Beetles

Mortality of Jeffrey pine caused by **Jeffrey pine beetle** continued throughout the east side of the Sierra Nevada and in the Cascade and Transverse ranges. Jeffrey pine mortality is expected to increase in these areas in 2009 due to continued below average rainfall.

Fewer trees were killed in 2008 by **mountain pine beetle** compared to 2007, due to the depletion of suitable hosts in many of the affected stands. Notable mountain pine beetle activity occurred in the Warner Mountains in Modoc County, Shovel creek in Siskiyou County, and High Meadows in El Dorado County. Hosts included lodgepole, western white and whitebark pines. Some areas have experienced 70-95% mortality over the last few years. Other mountain pine beetle activity observed included mortality of large sugar pines in part of the southern Sierra Nevada range and in pinyon pine in San Bernardino County.

Large groups kills of ponderosa pine (between 50-100 trees each) caused by **western pine beetle** were observed throughout Amador and Fresno Counties and in the Slate Creek drainage in Shasta County.

Mountain pine beetle activity in lodgepole, western white and whitebark pine in the Warner Mountains. Photo: Z.Heath

Northeastern California experienced slightly elevated levels of **fir engraver** activity in white fir, usually in association with overstocking, dwarf mistletoe, cytospora canker and annosus root disease. In the southern Sierra Nevada range fir engraver caused-mortality was associated primarily with annosus root disease.

Unknown oak leaf miner larva and injury on black oak. Photo: D. Cluck

Defoliators

No defoliation by **Douglas-fir tussock moth** or **California oak worm** was observed in 2008 despite the occurrence of large outbreaks in previous years, however, activity of an unknown species of leafminer affecting black oak increased dramatically. Leaf feeding was observed Placer County, and identical leaf injury was detected on black oak in Mariposa County as well. Identification of this leafminer is in progress.

Diseases

Annosus root disease continued to cause ponderosa pine and white fir mortality in Siskiyou County, and Jeffrey pine mortality in San Diego County. Older pockets of mortality were found near infected fir stumps in Placer and Tuolumne Counties.

New **black stain root disease** centers were found infecting Douglas fir in Humboldt, Lake, Plumas and Tuolumne Counties, and in ponderosa pine in Lassen and Shasta Counties. Mortality continued to be evident in ponderosa pine around the Mud Flow Research Natural Area (Siskiyou County) and Devil's Garden Ranger District (Modoc County), and in pinyon pine in San Bernardino County.

Black stain root disease center affecting pinyon pine near Big Bear Lake. Photo: P. Zambino

The **goldspotted oak borer (GSOB)** was determined in 2008 to be the primary cause of extensive oak mortality occurring in and around the Descanso Ranger District in San Diego County. Oak mortality had been documented as early as 2002 in aerial surveys and now encompasses an area of about 30 square miles. The borer was initially collected in Cuyamaca State Park in 2004 and has also been collected in Arizona, Mexico, and Guatemala. The goldspotted oak borer attacks the main stem and largest branches of coast live oak and California black oak.

Dorsal (A) and lateral (B) views of the GSOB adult.
Photo: T. Coleman

The **walnut twig borer** was recognized in 2008 as a serious pest of native black walnuts. This insect was first recorded in California in 1959 in Los Angeles County and has since been found in Anderson, Susanville, and Escondido. The walnut twig borer is a pest mainly due to the formation of cankers from a fungal associate which causes **thousand cankers disease**. Cankers coalesce, kill branches and result in tree decline and death. Mortality of black walnuts, most likely from thousand cankers disease, has been observed in the western United States over the past decade and has been detected in California in Yolo, San Joaquin, San Bernardino and Ventura Counties.

The population of **light brown apple moth** continued to grow throughout the coastal area of central California, from Napa and Sonoma County in the north to Santa Barbara County in the south. Over 71,000 moths have been trapped February 2007.

Black walnut with symptoms from thousand cankers disease.
Photo: S. Seybold

The first detection of feeding injury from this insect was noted on various hosts in Soquel in Santa Cruz County and on Australian tea tree in Golden Gate Park in San Francisco. Adult **European gypsy moths** were trapped for the second consecutive year near Ojai, Ventura County and egg masses were discovered by CDFA surveys on two separate properties. Eradication efforts have been initiated for both moths.

Two exotic bark beetles, the **Mediterranean pine engraver** and the **redhaired pine bark beetle**, continued to be trapped in the San Joaquin Valley and southern California in 2008. The redhaired pine bark beetle was detected in native knobcone stands in San Bernardino County.

European gypsy moth egg mass, Ojai, CA.
Photo: CDFA

A second year of below average rainfall was not conducive to introduced disease spread in 2008. A survey around Riverside campground in Castle Crags State Park and at Scott Camp Creek in Siskiyou County found no **Port-Orford-cedar root disease** activity outside the treatment areas. **Pitch canker** was not detected in any new counties, but did spread and intensify in multiple locations within the Point Reyes National Seashore.

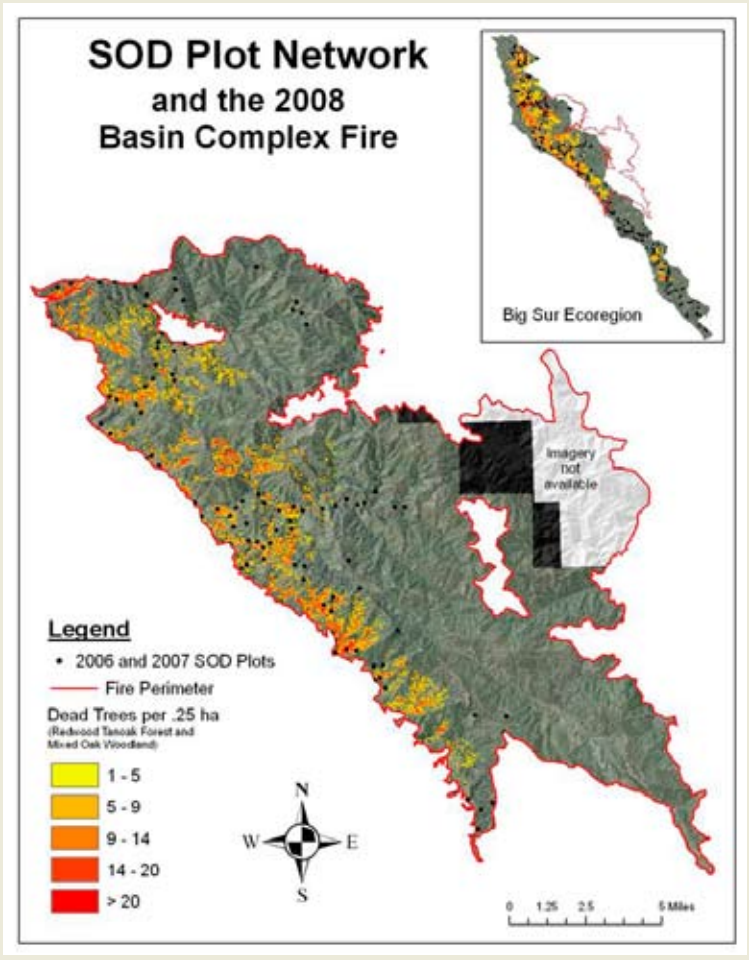
Symptoms of **maple leaf scorch** were exhibited on nearly many big leaf maple trees in northeastern California. Maple trees in some areas of Plumas, Butte and Sierra Counties were in an advanced state of decline, with only very young regeneration showing signs of good health and vigor. Samples sent to Rutgers University were determined to be positive for the bacteria ***Xylella fastidiosa***. The same species of bacteria also causes Pierce's disease in grapes, citrus X disease, and sweetgum leaf scorch, but is still undetermined if this bacteria is the direct cause of maple leaf scorch.

Symptoms of Port-Orford-cedar root disease in the upper Sacramento River drainage. Photo: P. Angwin

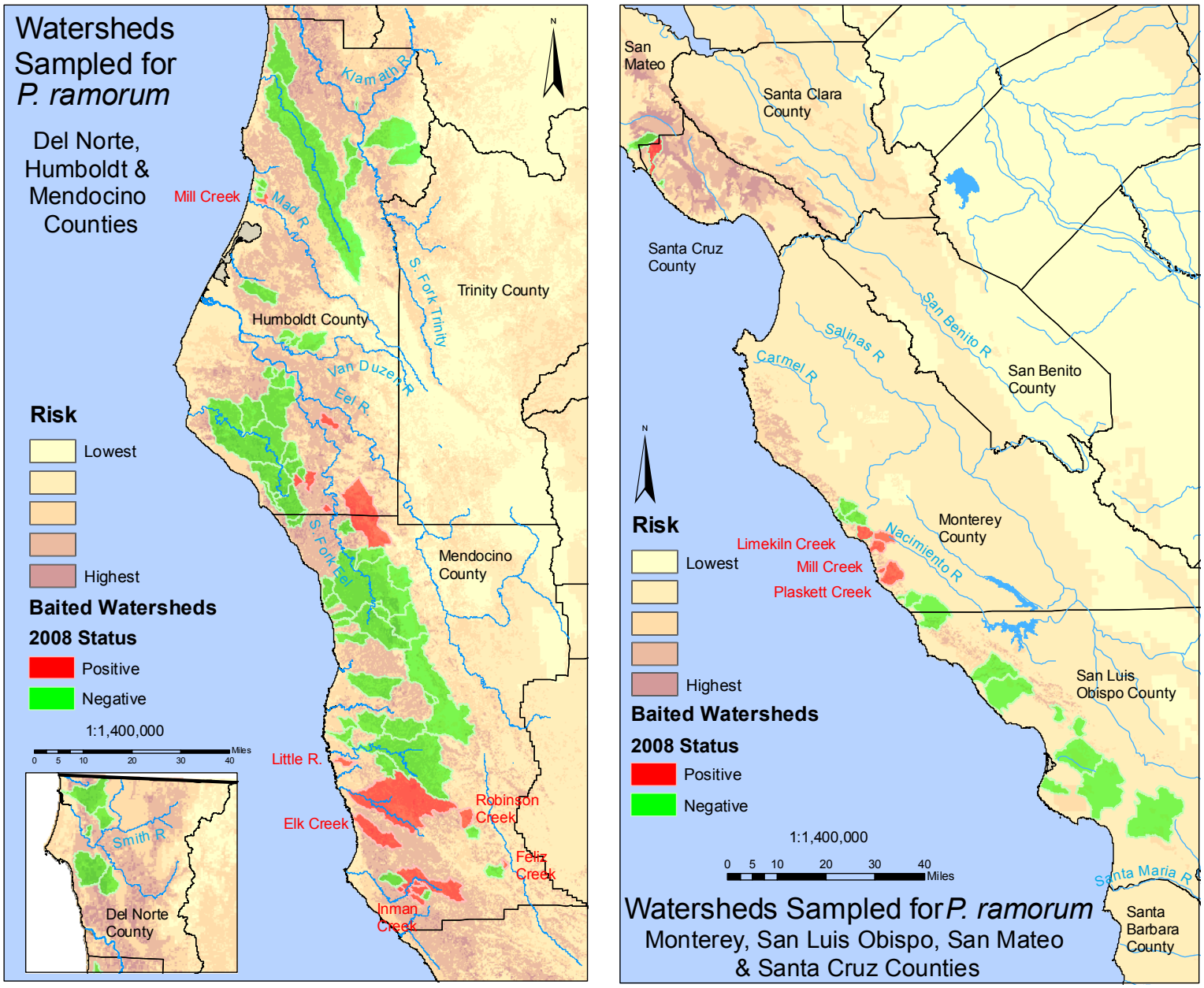
The spread of **Sudden oak death (SOD)** was also limited by the dry spring conditions. In 2008 , 1/3 fewer SOD-affected acres were mapped compared to 2007. However, *P. ramorum* was detected in new watersheds during stream monitoring, comprised of 151 separate sampling sites. New positives were detected in Mill Creek near McKinleyville in northern Humboldt County, and in Elk, Inman and Feliz Creeks in southern Mendocino County. The Little River in Mendocino County was also found to be positive for *P. ramorum* in 2008, indicating movement of the pathogen north along the Mendocino coast. Mill Creek in Monterey County was the only new positive detected during stream monitoring on the central coast. None of the 31 watercourses sampled in the Sierra Nevada were found to be positive in 2008 (page 5).

Aerial surveys for SOD-infected species were also conducted in 2008 in Del Norte and San Luis Obispo Counties to identify areas of oak mortality for targeted ground surveys. P. ramorum was not detected in either of these uninfested counties during ground surveys.

The Basin fire, which occurred in June and July of 2008 in and near Big Sur, burned thousands of acres of forestland that had high levels of SOD-caused tree mortality. Preliminary surveys indicate that fire behavior was more severe in areas of SOD-caused tree mortality. A long-term ecological plot network in the Big Sur region was established in 2007 and 90 of the 280 plots were encompassed by the fire. A post-fire assessment was initiated in September of 2008 within those plots to determine the degree to which variation in SOD-caused mortality might have influenced fire severity. SOD was also implicated in the ignition of a fire in Napa County where a *P. ramorum*-infected coast live oak fell on a power line.



SOD plot network in the Big Sur Ecoregion and the area burned in the Basin Complex Fire.
Map: D. Rizzo

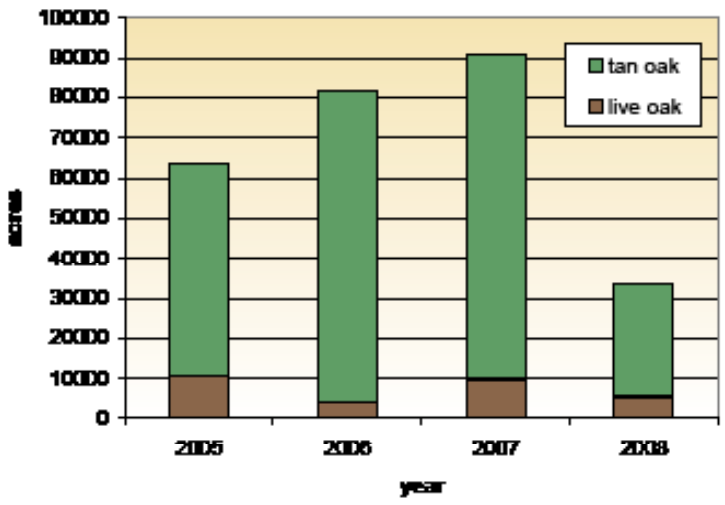


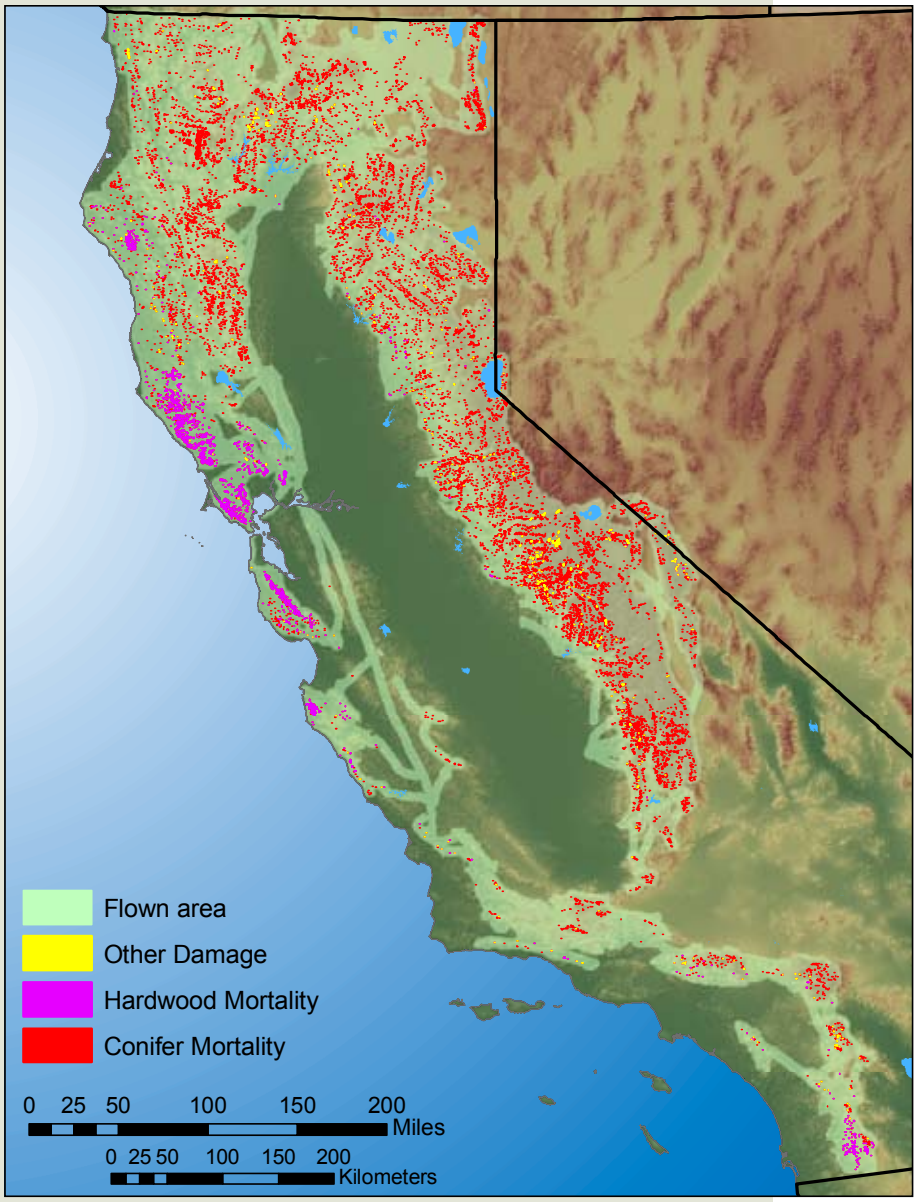
Watershed monitoring for *Phytophthora ramorum*. Maps: Z. Heath

Surveys of California nurseries resulted in 13 detections, including four producers, two wholesalers/producers, one production/retail, and six retailers. Seven of these nurseries had not been found to be positive for *P. ramorum* in the past. Approximately half of the nurseries were within quarantined counties, the remainder being in non-infested counties in Southern California. One nursery in San Mateo County was found to contain all three lineages of *P. ramorum*, including the European strain. This is of concern because *P. ramorum* currently only undergoes asexual reproduction in California. Presence of multiple strains could result in sexual reproduction of this pathogen, potentially leading to more aggressive strains and an increase in susceptible hosts species.

Despite the positive nursery finds in 2008, the overall impact of detection and management practices dramatically reduced the incidence of *P. ramorum* in California nurseries.

Acres of SOD-caused tree decline/mortality detected by aerial survey





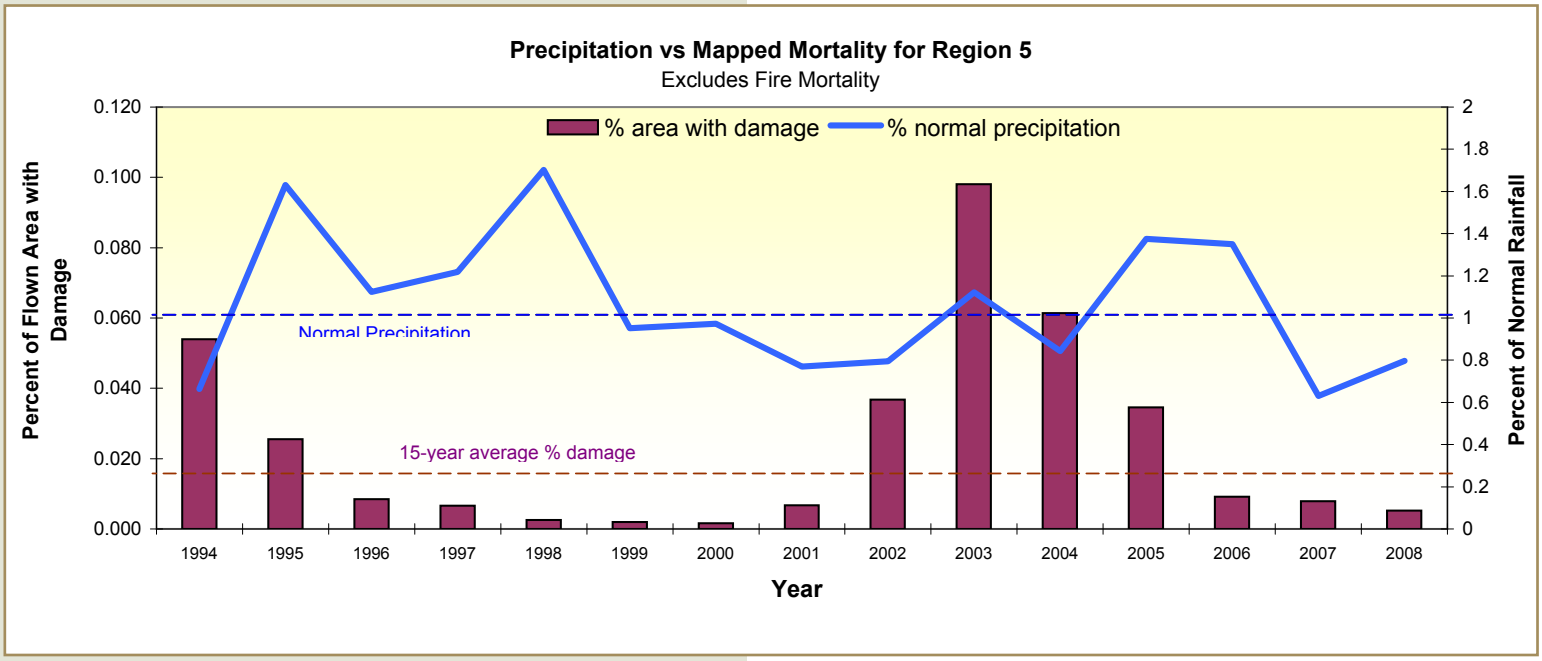
Area flown and injury detected in 2008. Map: Z. Heath

The US Forest Service Forest Health Protection program conducts aerial detection surveys nationally. Surveys have been conducted in the Pacific Southwest Region annually since 1994. Data is collected using a digital aerial sketch mapping system following national protocols in order to provide standardized information on biotic and abiotic-caused injury to California's forests.

Approximately 41 million acres were flown in California in 2008, including almost 20 million acres of National Forest Service land, over 16 million acres of private land, and 5 million acres of state and other federally managed land.

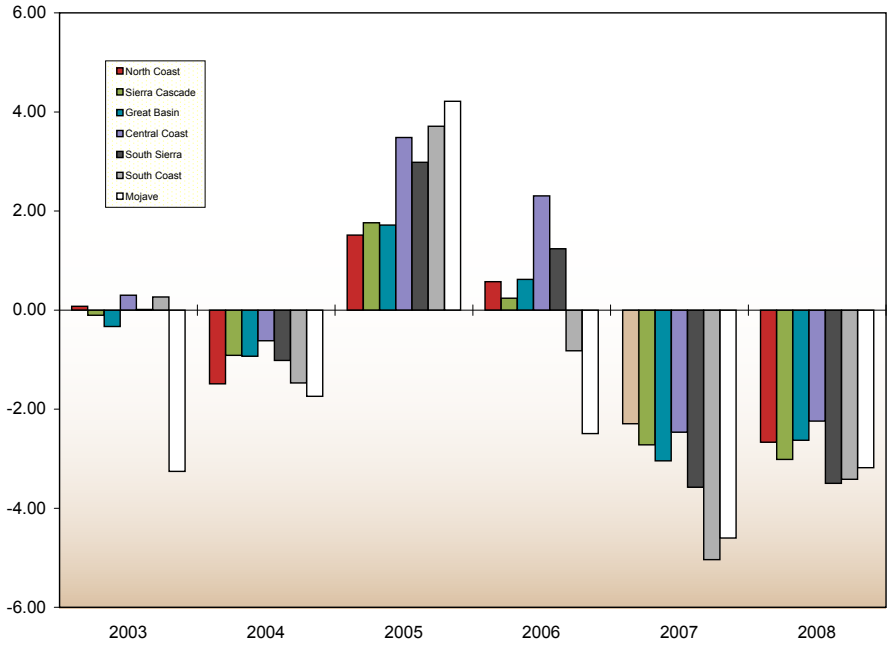
Approximately 217,000 acres with mortality or injury caused by biotic agents such as bark beetles and diseases were observed and mapped in 2008 in California. This is down over 100,000 acres from last year. The reduction can be attributed partly to large areas of forested land that burned over in 2007 and 2008 that typically contain tree mortality, especially the large acreages of oak mortality in the Big Sur area that burned in the Basin Fire in 2008.

To download the final aerial detection survey report and learn more about aerial detection monitoring, view standards and metadata, or to download printable maps and data, go to: www.fs.fed.us/r5/spf/fhp.



Weather

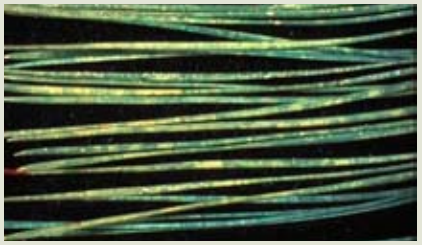
Information from two sources was used to illustrate meteorological conditions in California over the past few years: the Palmer Drought Indices and data collected by the California Department of Water Resources. The Palmer Drought Index is an indicator of drought or moisture excess and ranges from -6 to +6, with the negative values denoting degree of drought. Moderate to severe drought conditions continued for most of California in 2008. The statewide average snowpack condition in April was 85% of normal. Overall precipitation for the state was at 76% of normal in April, following an average precipitation of 63% in 2007. Drought impacted a number of tree species throughout California, including: incense cedar, Douglas-fir, and various oak and chaparral species.



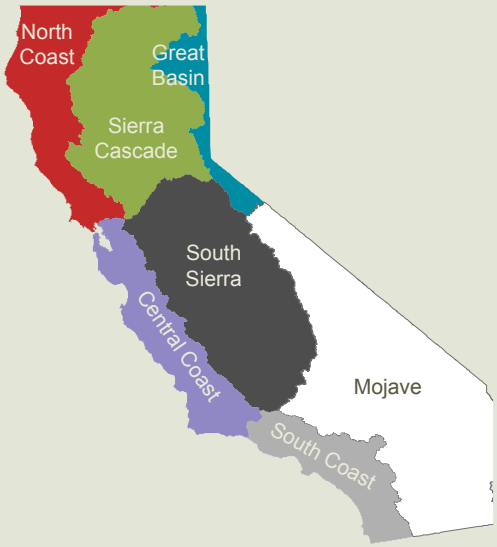
Palmer drought indices for the seven hydrologic zones in California, 2001-2006.

Ozone

Overall, foliar injury caused by ozone was low in 2008 in plots in San Bernardino County. Little to no ozone injury was detected on current year foliage elsewhere in the state.



Ozone injury on ponderosa pine needles. Photo: N. Grulke



Hydrologic zones in California.

Fire

The dry lightning strikes in mid-June caused thousands of fires in the north coastal and inland counties. The fires killed or scorched thousands of trees, affecting over 800,000 acres. The fires were early enough in the fire season to allow 2008 insect attacks. Spring and early summer of 2009 will likely reveal the extent of insect activity in and adjacent to the fires.

Basin Fire, Monterey Ranger District, Los Padres National Forest.

Photo: Z. Heath

Crown injured true fir, Moonlight Fire, Plumas National Forest. Photo: D. Cluck

Contacts and Additional Information

If you have questions about forest insect and disease activity in California, please contact personnel one of these regional or field offices:

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Forest Service Pacific Southwest Region

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